

# Effects-based Operations: An Overview



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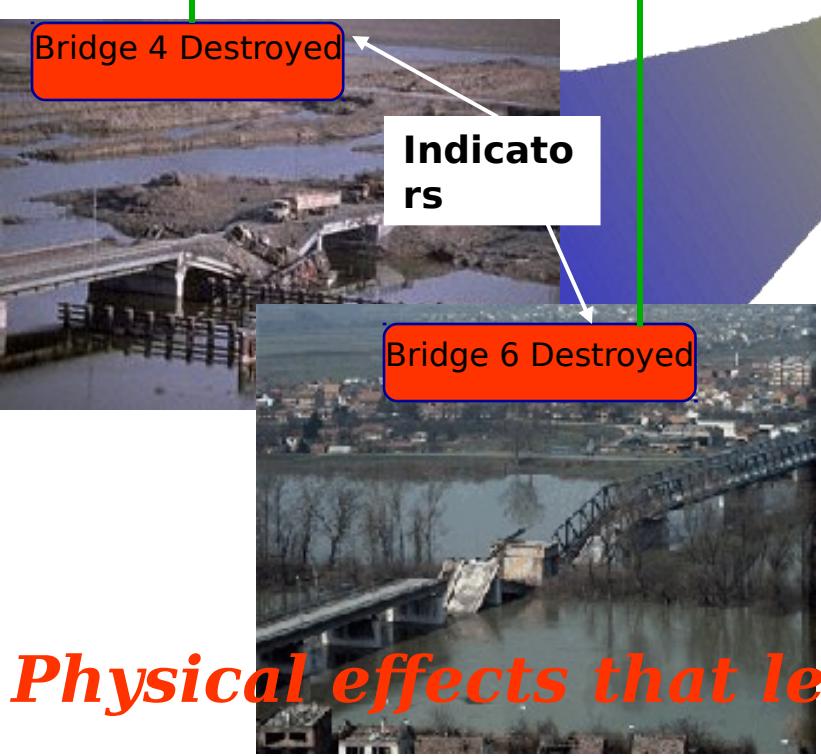
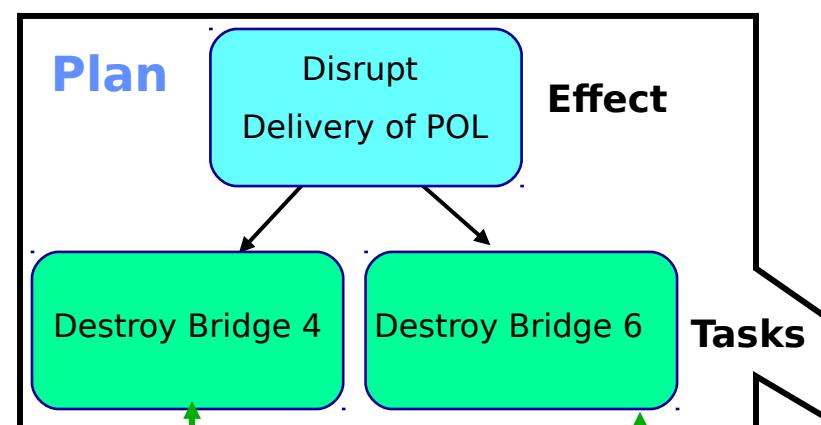
# Overview



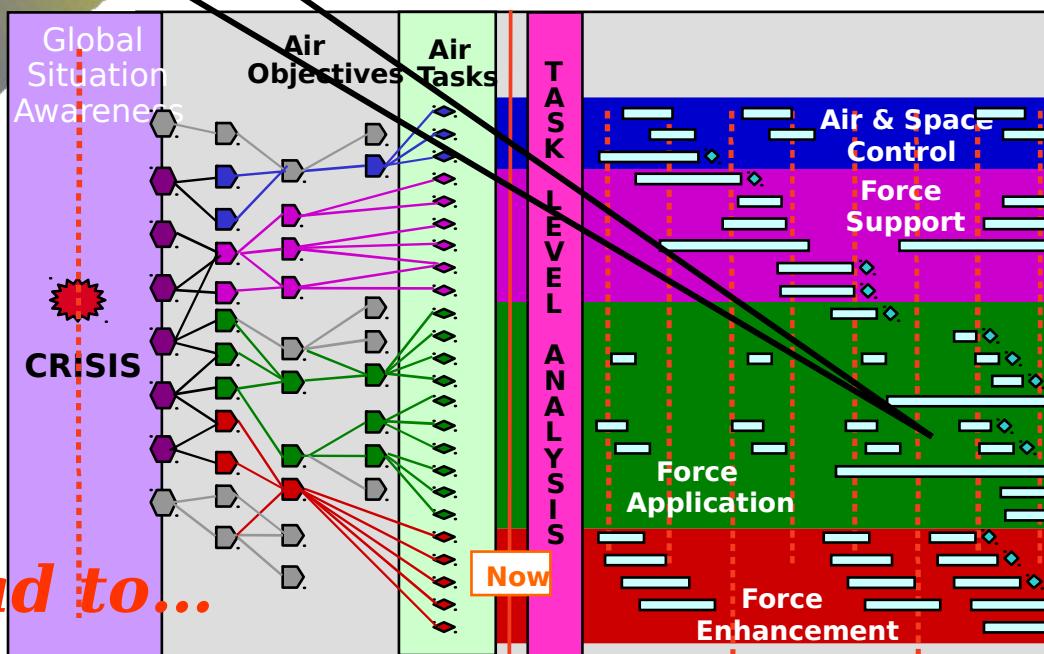
- **Introduction**
- **Definitions**
- **Models**
- **ATD Technologies**
- **EBO in Operation ALLIED FORCE**



# Effects-Based Operations



*...desired behavioral outcome*



*Physical effects that lead to...*



# Effects-Based Operations



"Effects based operations is a methodology for planning, executing and assessing operations to attain the effects required to achieve desired national security objectives." **AFDD 1**

**EBO ...**

- **is an approach, a way of thinking**
- **supports all missions from HUMRO to MTW**
- **utilizes lethal and nonlethal force**
- **offers an approach that models an "Enemy as a System"**
- **offers Economy-of-Force**
- **offers an approach to *Effects-based Dynamic ISR Management***

***The challenge is predicting & assessing what physical actions***



# Comparison of Effects-Based, Objectives-Based and Targets-Based Operations



## Target-Based (TBO)

- ID enemy entities, destroy them
- Focus: physical effects at target level
- Looks at 1st and 2nd order effects only
- No dynamic assessment
- No explicit timing considerations

## Objectives-Based (OBO) (Strategies-to-Task)

- Strategies at one level become objectives for the next
- Focus: objectives at every level
- Considers linkages between objectives and strategies to achieve those objectives
- No dynamic assessment
- No explicit timing considerations

## Effects-Based (EBO)

- Address causality between actions and effects
- Focus: desired effects (physical and behavioral)
- Encompass both target and objective-based approaches
- Models the enemy-as-a-system w/adversary interactions
- Considers Direct, Indirect, Complex (synergistic) effects
- Cumulative & Cascading effects
- Timing explicitly considered
- “Overcoming” mechanism stated & assessed



# Definitions

- **No doctrinal template in approved Joint doctrine**
  - **USAF Doctrine has rudimentary definitions**
- **Physical => Behavioral**
  - **destroy (damage), disrupt (Kosovo), degrade, dislocate, decapitate, divert, delay (isolate), deny (halt), deceive, defend, deter (D<sup>11</sup>)**
  - **coerce: punish, threaten (George, Schelling)**
- **Historically and theoretically behavioral most important but hardest**
  - **therefore, traditionally military operations focus on physical effects**
- **Major problems with behavioral effects:**
  - **causality between action & effect**
  - **observability of effect**
  - **uncertainty of intervening variables**



# AFDD 2-1 Definitions



- **Direct Effect**
- **Indirect Effect**
- **“Effects” described**
- **Limitations:**
  - **Precise definitions of “effects”**
  - **Effects versus Objectives**
  - **Conflating Mechanism**
  - **Connections between Direct & Indirect Effects**
  - **Complex or Cascading Effects**



# AFDD 2-1 Definitions



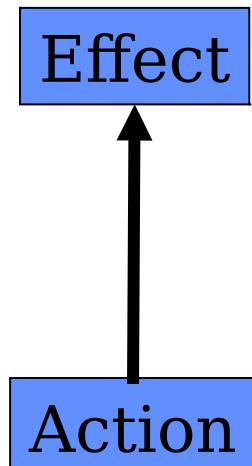
- **Direct Effect:** “Result of actions with *no intervening effect or mechanism* between act and outcome. Direct effects are usually immediate and easily recognizable.” (AKA 1st order effect)
- **Indirect Effect:** “Result created through an *intermediate effect or mechanism* to produce the final outcome, which may be physical or psychological in nature. Indirect effects tend to be delayed, and may be difficult to recognize.” (AKA 2nd, 3rd, ..., *n*-order effects)



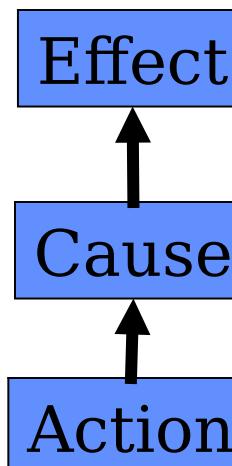
# Effect



- **A result from some action**
  - Assumes a causal connection
  - “**IF x THEN y**” is a **statement of (direct) effect**
- **Point of View dependent**



AFDD 2-1



EBO CONOPS



# Mechanism



- **Actions Cause Results (Effects)**
- **Mechanism explains cause**
  - **Rationale explains purpose (Commander's Intent)**
- **IF (x; action) THEN (y; result) BECAUSE (a, b, ... ; mechanism)**
  - **Uncertainty in action, result and cause suggest a probability-based approach (Bayes)**
- **Clausewitz: if you defeat an enemy's fielded force, then a rational leader will submit because his country is undefended.**
- **Douhet: if you terrorize the population, then a rational leader will submit because the populace will rise up, rebel, and force submission.**



# Mechanism continued



- **Slessor:** if you **interdict infrastructure** or supply, then fielded forces will be less combat capable, making them easier to defeat which leads to...an undefended country.
- **Schelling:** if you **threaten things leadership** value, then they will submit rather than lose those things.
- **Warden:** if you **isolate leadership**, then they are prevented from doing something which would thwart our will. They submit because the imposed paralysis prevents them from doing otherwise.



# Mechanism finished

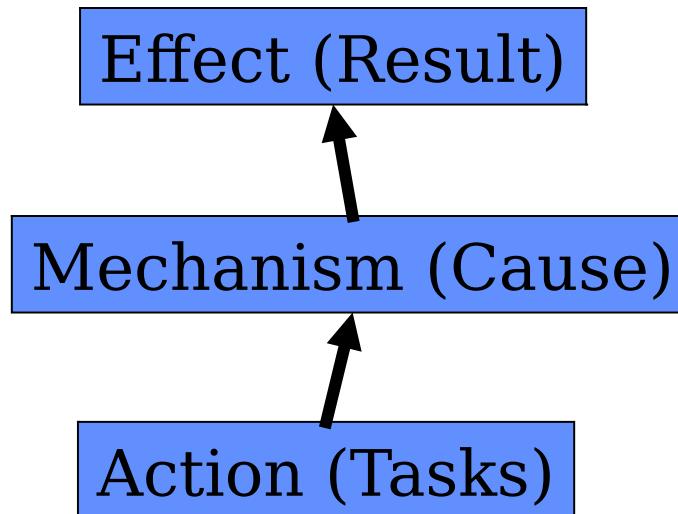


- In reality these are few, if any, single mechanisms at work.
  - Direct and indirect effects combine to form complex and cumulative effects
  - Effects cascade for good or ill
- Predicting, then assessing, how physical actions spawn behavioral effects (i.e., results from actions) is *the* major challenge.



# Actions & Tasks

- **Tasks are work (actions) to be done**
  - Operationally, tasks are normally assigned to tactical units (squadrons, brigades, CVBGs, etc.)
- **EBO theory is agnostic to the originator of action**

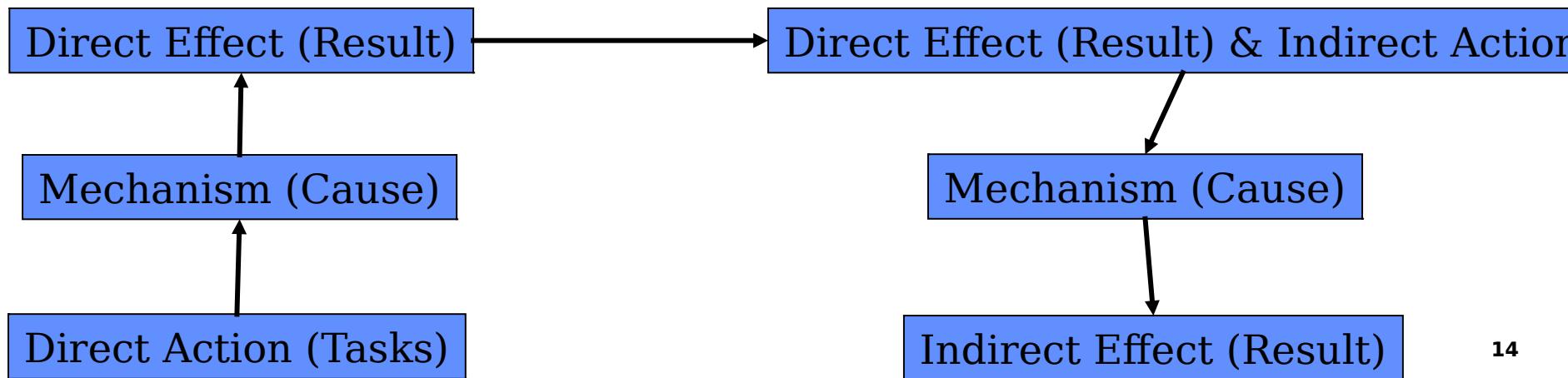




# Direct & Indirect Effects



- **Direct Effects result from (caused by) direct actions.**
- **Indirect Effects result from (caused by) indirect actions.**
- **Indirect actions may be the result of a (previous) direct effect.**

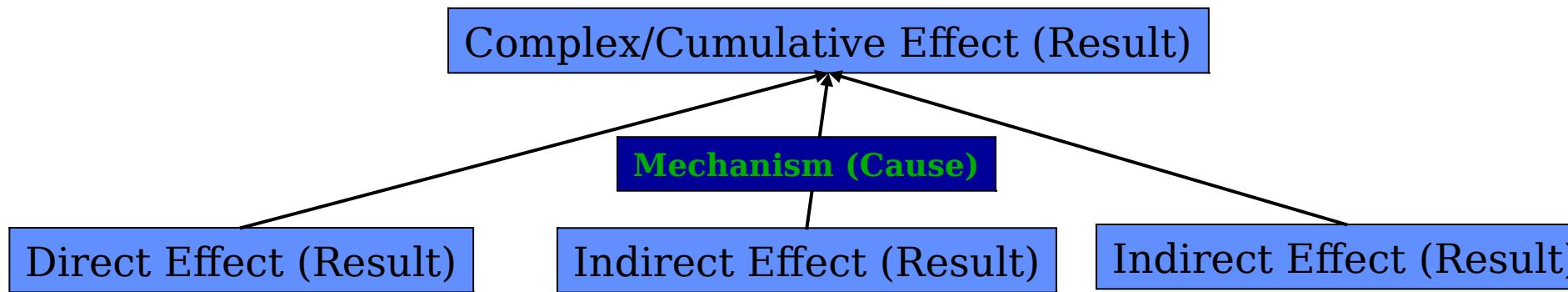




# Complex & Cumulative Effects



- **Complex Effects** are a combination of effects, either direct or indirect, at an instant in time & space.
  - Mechanism explains how these effect combine
- **Cumulative effects** are complex effects as viewed over some time interval.
  - Effects do have persistence, though that generally varies





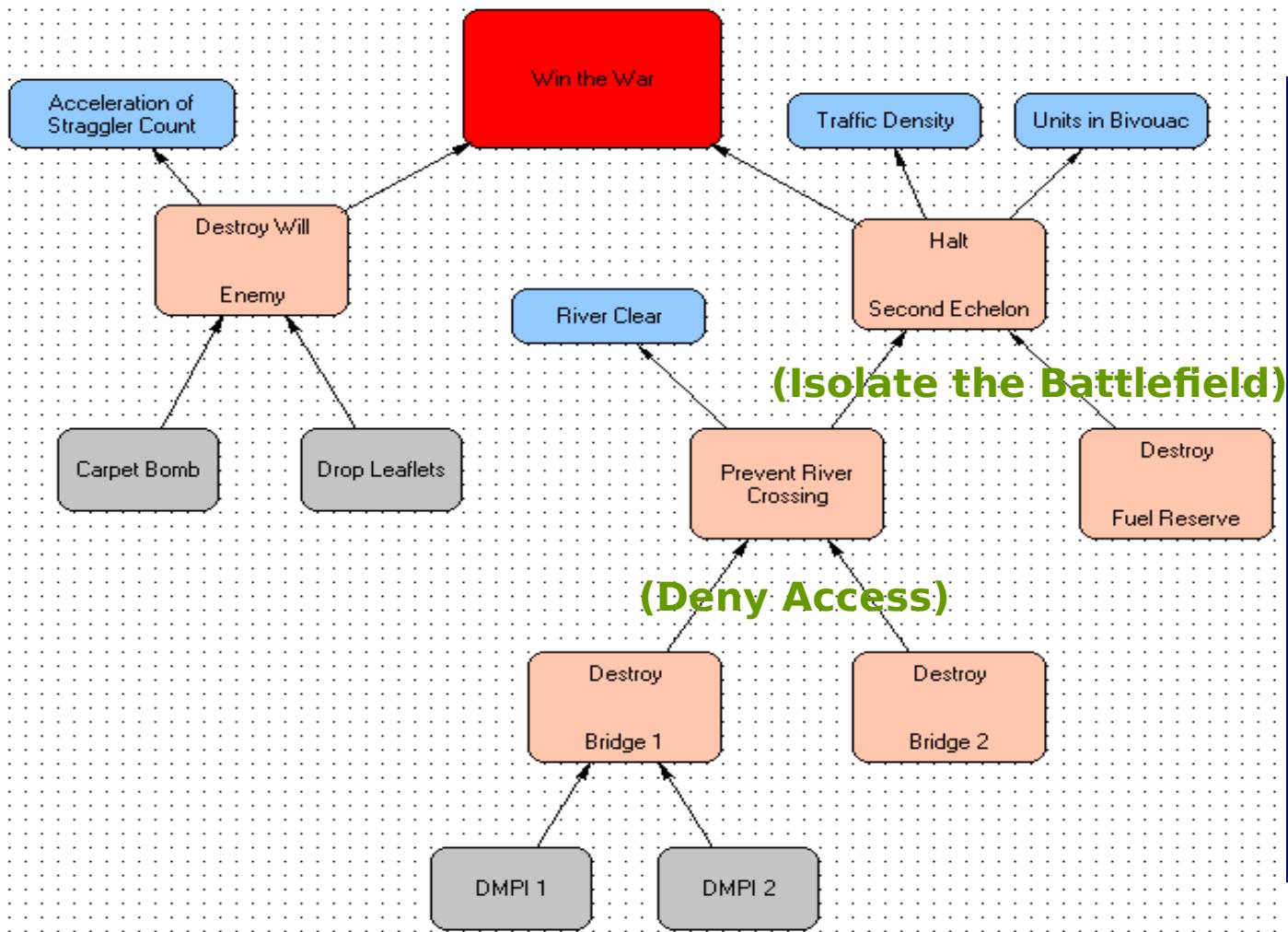
# Cascading Effects



- **Cascading effects are direct, indirect, complex or cumulative effects that ripple through a system**
  - **Captures the notions of an acceleration or a multiplier effect (from economics)**
  - **Requires a systems perspective: relationships, dependencies, or connections between elements**
- **Cascading effects can be vicious or virtuous but which they are is point of view (POV) dependent**
  - **What's bad for the bad guys is good from our POV but bad from theirs**
  - **In a HUMRO, what's good for the object of our attention is good from our POV and theirs**



# Effects-Based Plan Representation



## EBO Terms

**Objective**

**Effect Desired**

- direct effect
- indirect effect
- complex effect
- cumulative effect

**Indicator**

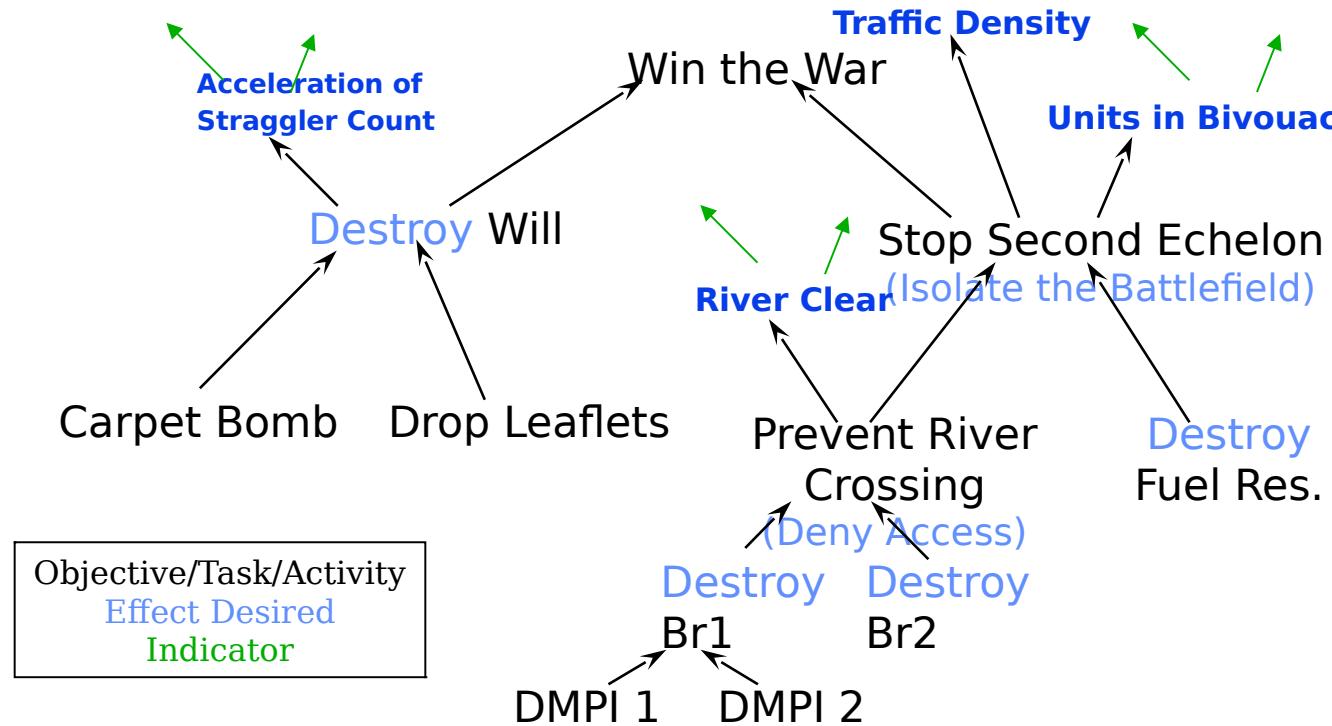
**Task/Activity**

**(Mechanism)**



# Indicators

- Are not effects
- Better to be observable then not but “not seen” does not mean “not there”





# Strategy: Definitions



- The art & science of employing the armed forces...to secure the *objectives* of national policy by the application of force or the threat of force. [JP 1-02]
- A *means*<sup>1</sup> to accomplish an end. [AFDD 2-1]
- The use of *engagements* for the object of the war. [Clausewitz]
- The art of distributing & applying military *means*<sup>2</sup> to fulfill the *ends* of policy. [B.H. Liddell Hart]
- A *plan* of action designed in order to achieve some end; a *purpose* together with a system of measures for its accomplishment. [RADM J.C. Wylie]

<sup>1</sup>tool, implement

<sup>2</sup>resources



# Strategy, Objectives & Effects



- **Goal, Strategic Aim, End-State: the realm of policy—the decisive results**
  - An **end-state** is the set of required conditions that achieve the strategic objectives. [JP 3-0]
- **Operational Art: determines *where, when & for what purposes* [why<sup>2</sup>]...forces will be employed**
  - Use resources efficiently & effectively to achieve strategic objectives [JP 3-0]
  - Defines the parameters of operations (restraints & constraints) [FMFM 1-1]
- **Effects: the result (outcomes) of direct actions (e.g., missions) and “indirect” actions (e.g., functions) [AFDD 2-1]**

<sup>2</sup>rationale



# Ends, Ways, Means, Risk



- **Ends:** What military *conditions* must be produced...to achieve the strategic *goal*?
- **Ways:** What sequence of *actions* is most likely to produce [those] condition(s)?
- **Means<sup>2</sup>:** How should *resources*...be applied to accomplish that sequence of actions?
- **Risk:** What is the likely cost...in performing that sequence of actions

[JP 3-0]



# Strategy, CONOPS & COA



- A **verbal or graphic statement, in broad outline, of a *commander's assumptions or intent* in regard to an operation....It is included primarily for additional clarity of purpose.** [JP 1-02]
  - **Commander's Intent: end-state, purpose, method & risk**
- A **plan that would accomplish a mission. Includes CONOPS. Basis for the development of an OPLAN or OPORD.** [JP 1-02]
  - **Tasks—work to be done—given to tactical (engagement level) units to accomplish.**



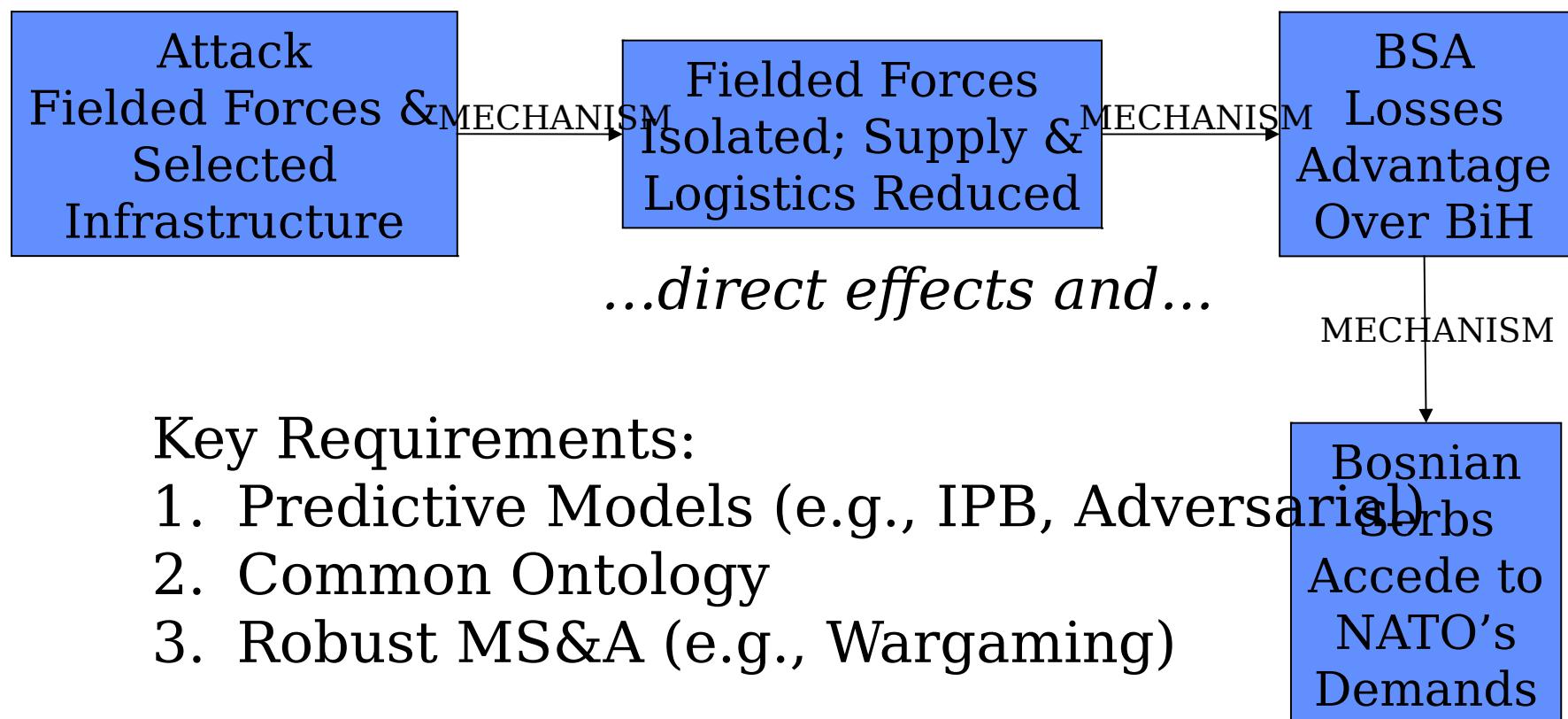
# *Models*



# Basic Model

*Actions cause..*

***Mechanism explains Cause***



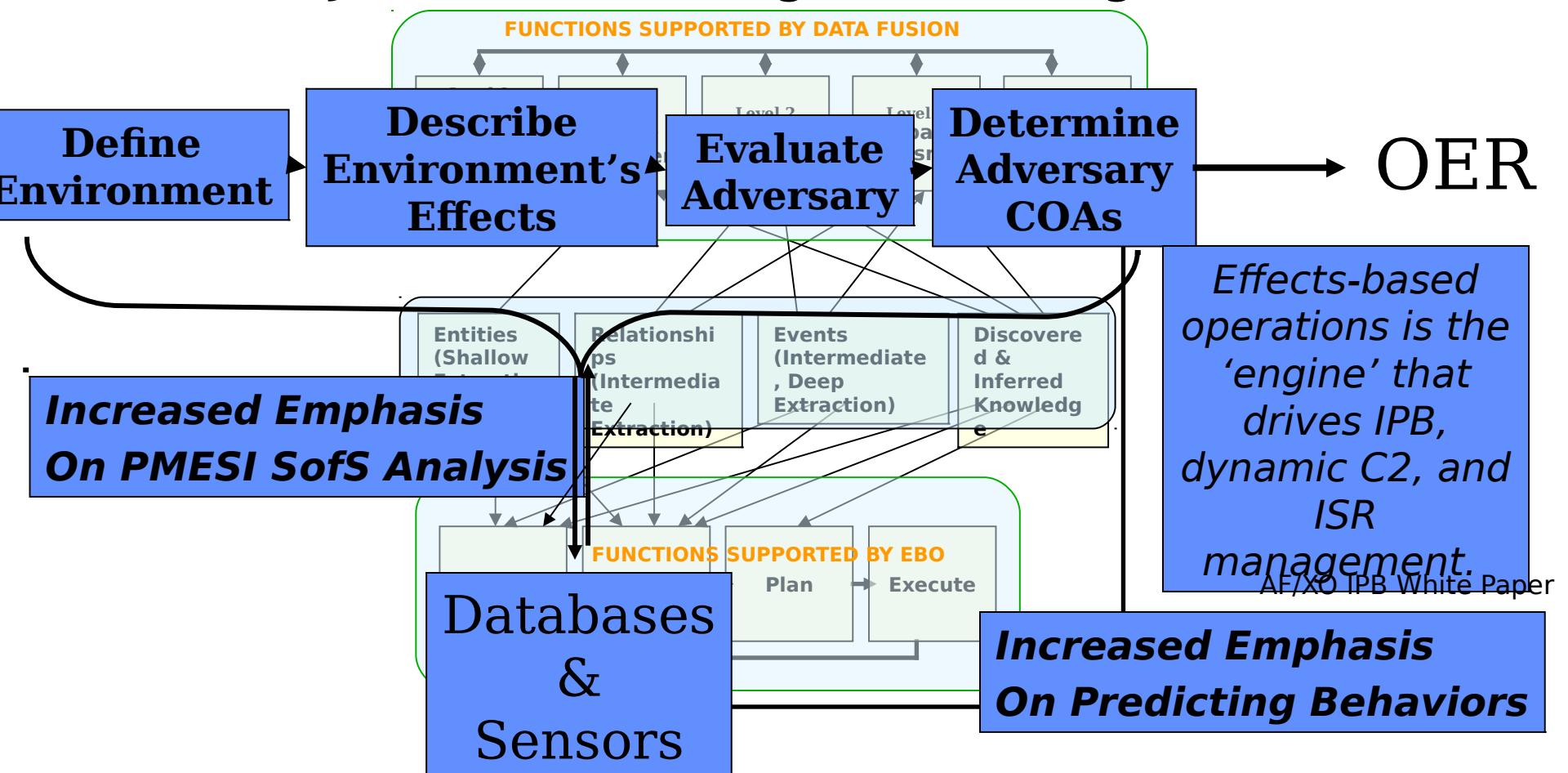


# JIPB, ONA, PBA & EBO



**ONA: JIPB + COA Options (JFHQ Con. Of Employment)**

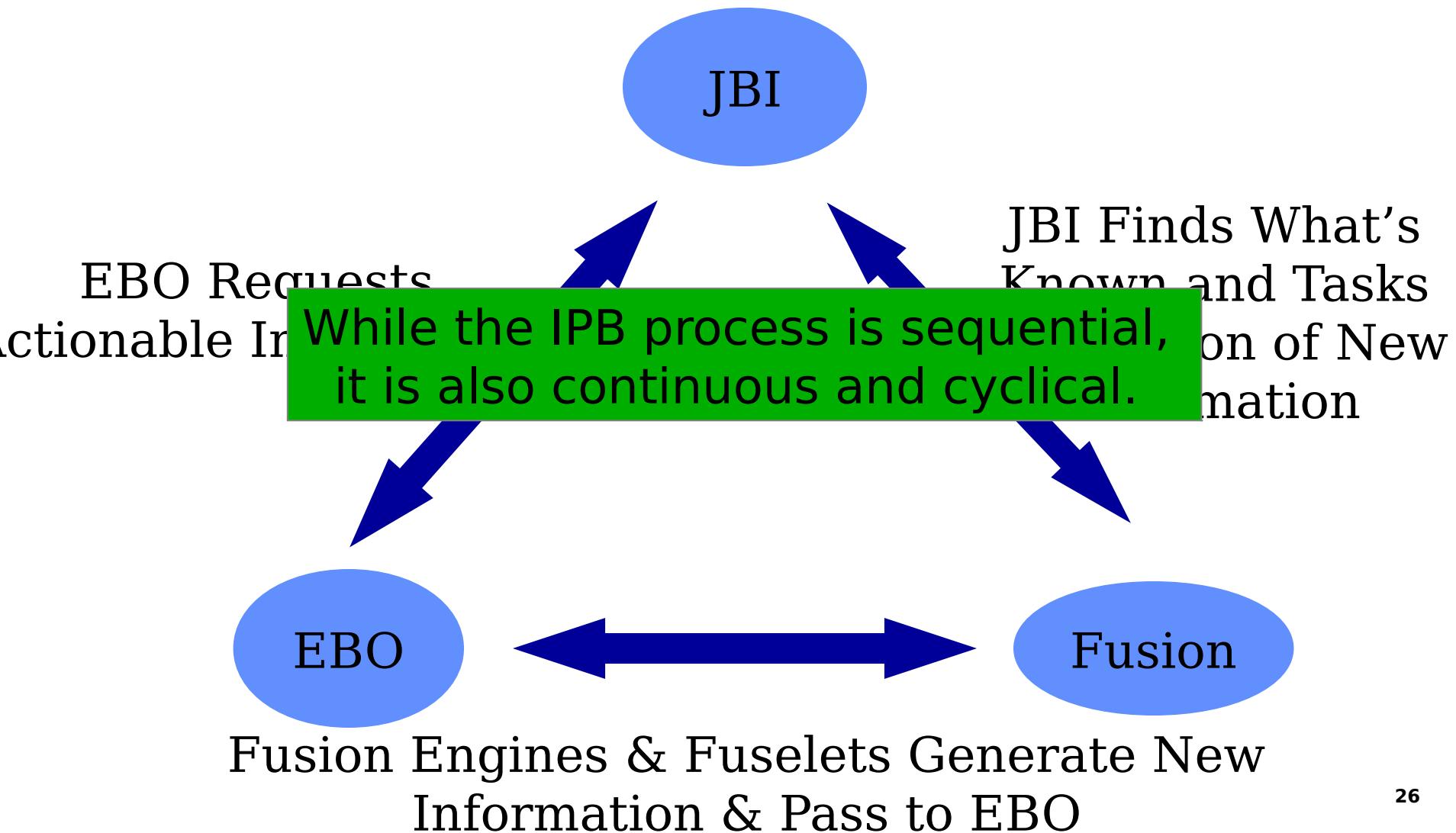
**PBA: JIPB + ISR Planning + ISR Management (PBA CONOPS)**



**Supports JP 3-56.1 Stage I: Operational Environment<sup>25</sup>**



# Working Together





# EBO Macro Model



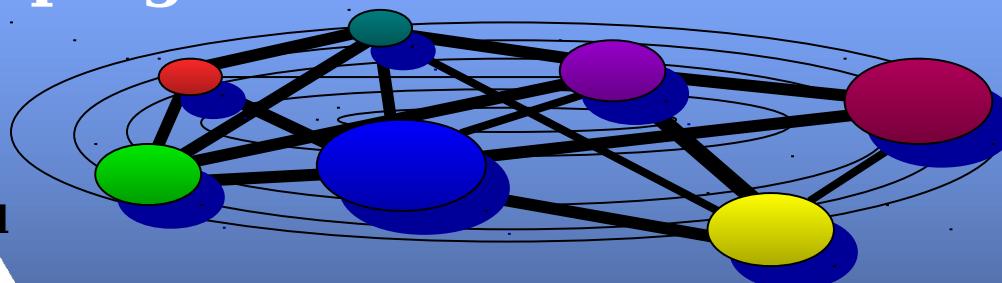
2. Operations  
Anticipated  
Responses

Predicted Effects

Campaign

1. Desired  
Behavior  
(COG/TS Level)

Plan

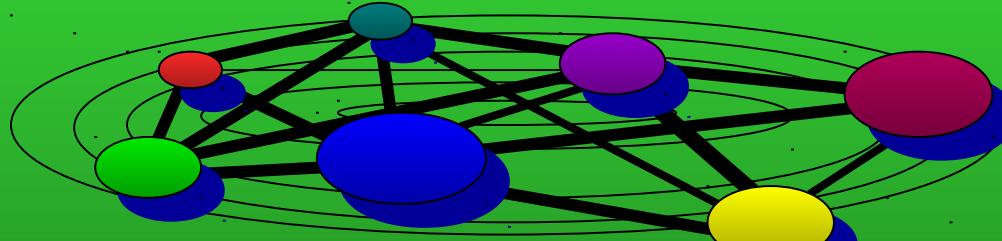


Assess

Observed Effects

Combat

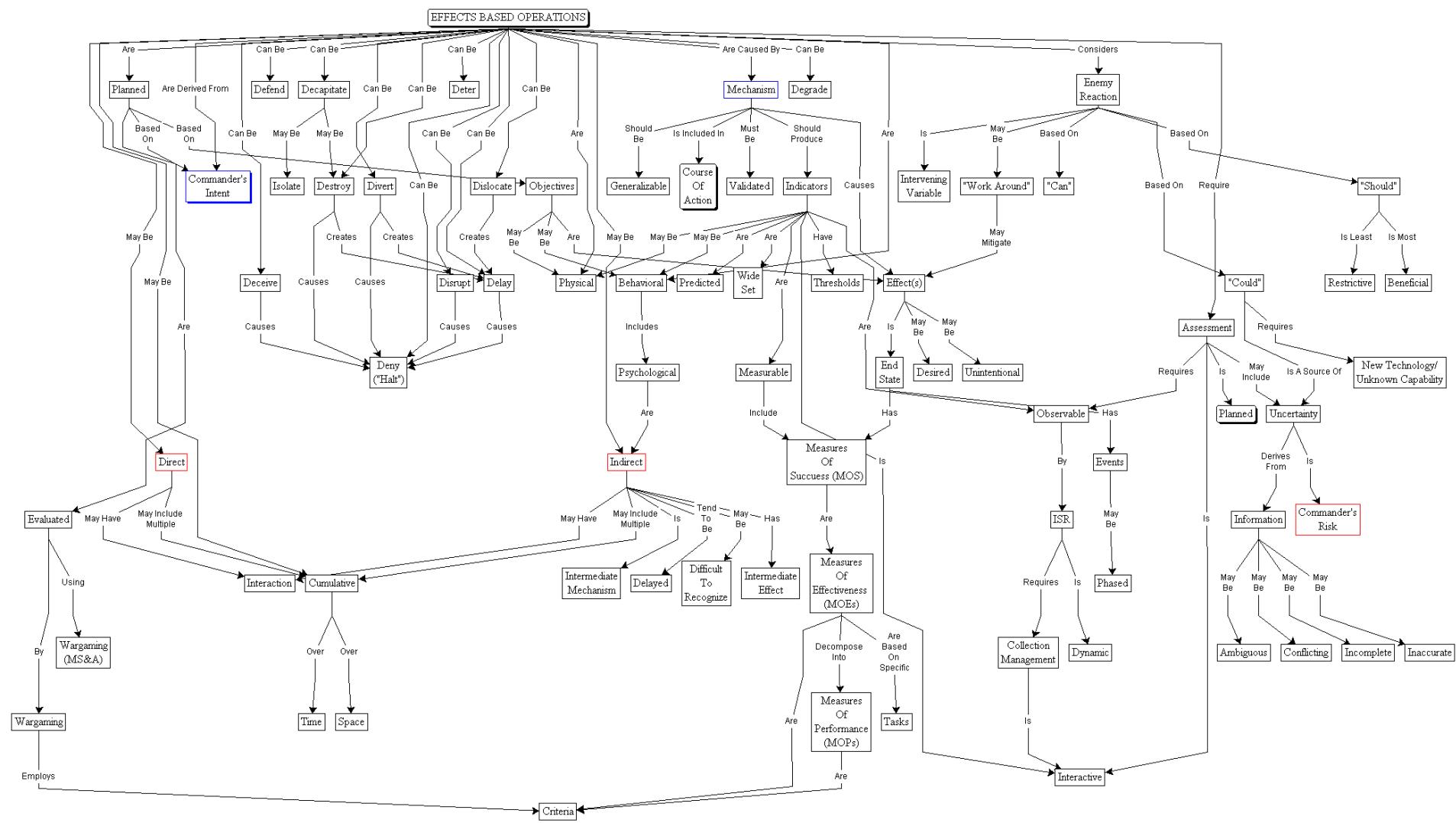
3. Actual  
Operations  
(Target Set /  
Target / DMPI  
Level)



4. Actual  
Responses  
(COG/Target System  
Level)



# Semantic Network

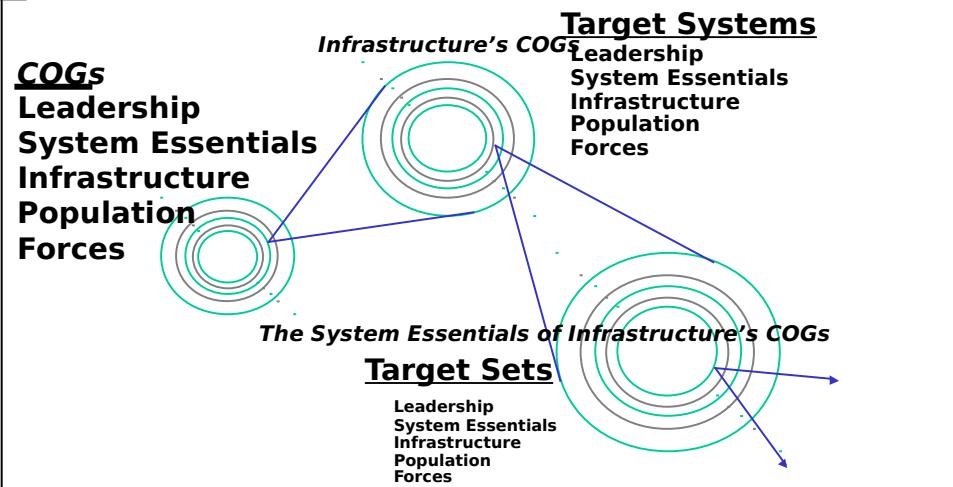


# Approach to Modeling EBO

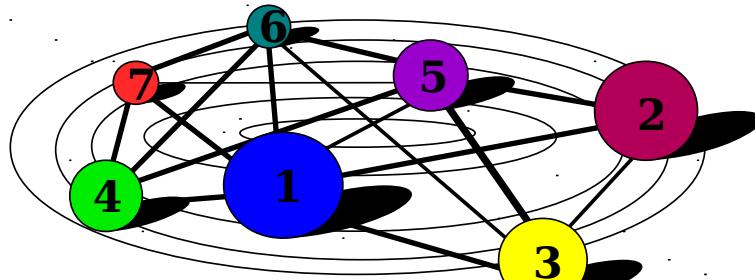
## JP 3-56.1 Campaign Planning Model



## Warden's "Enemy As A System" Model



## Barlow's "National Elements of Value" Model

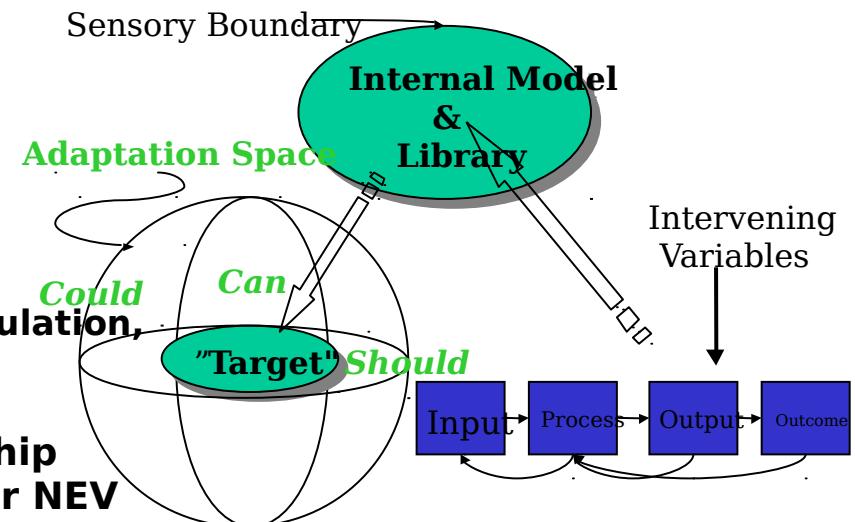


1. Leadership, 2. Industry, 3. Armed Forces, 4. Population, 5. Transportation, 6. Communications, 7. Alliances

Size = Importance of NEV to National Leadership

Thickness = Importance of Connection to other NEV

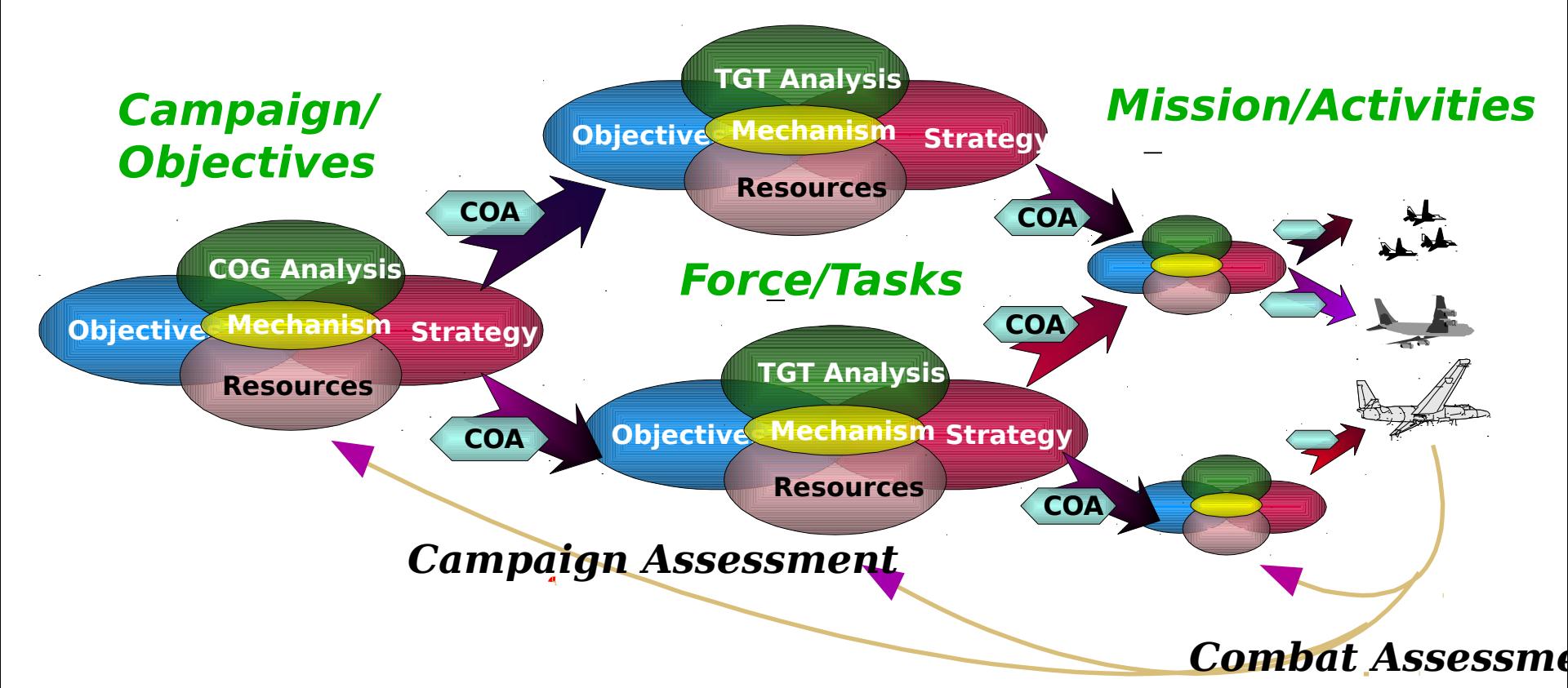
## McCrabb's "Enemy Reactions" Model





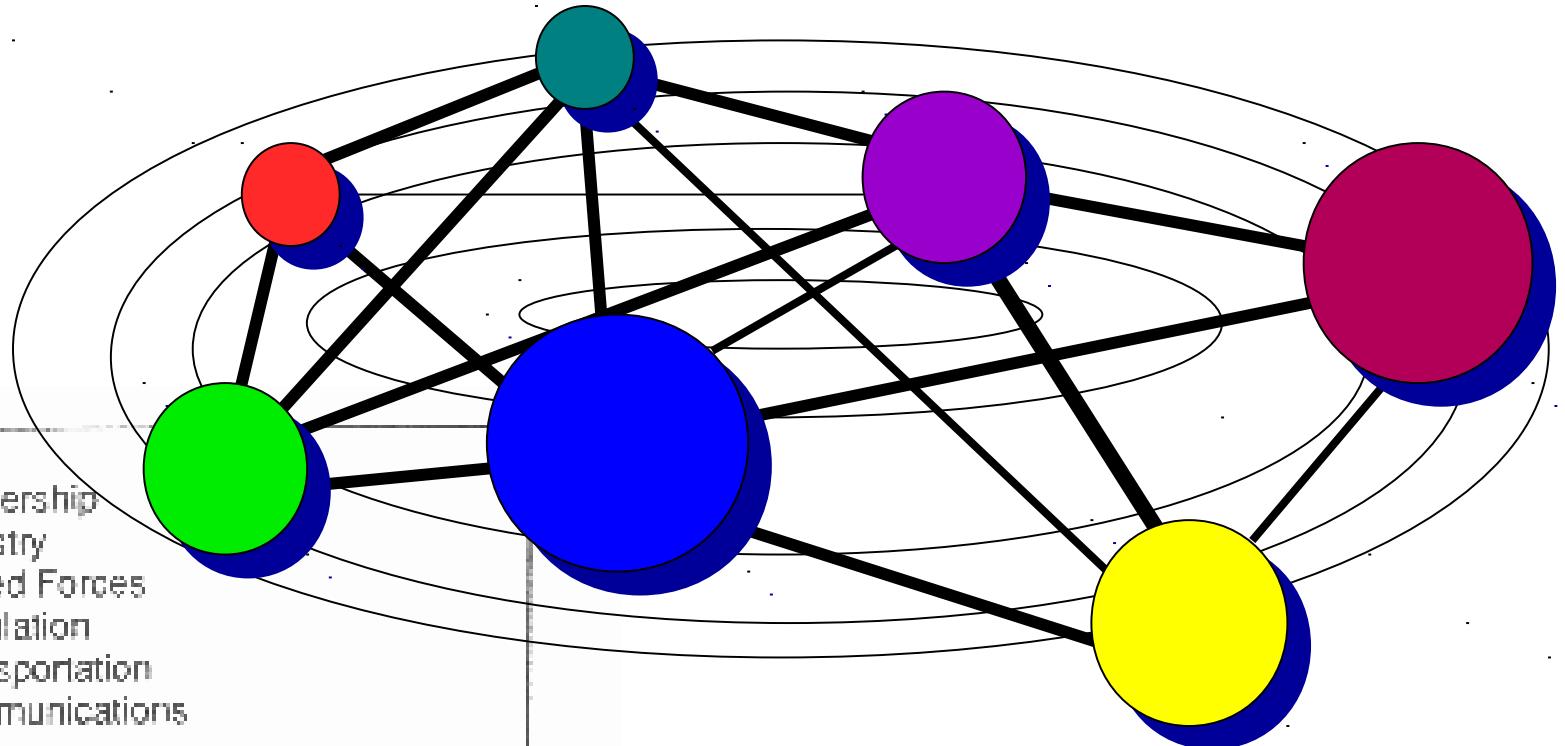
# Campaign Model

## Stage I: OER (IPB)





# Barlow's NEVs



Stage III: COG Identification

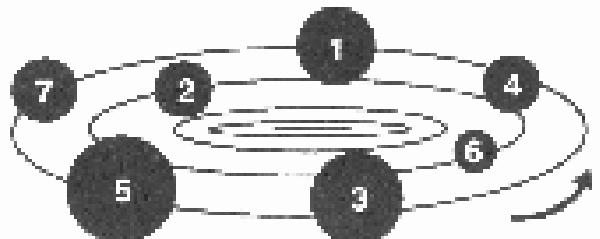


Figure 4. Model of Dynamic National Elements of Value



# Warden's "Rings" (Stage III)



*COGs*

Leadership

System Essentials

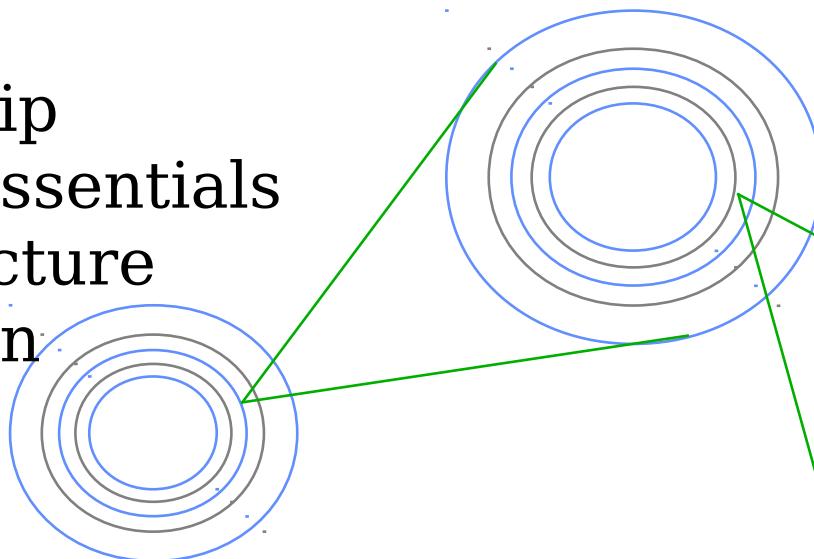
Infrastructure

Population

Forces

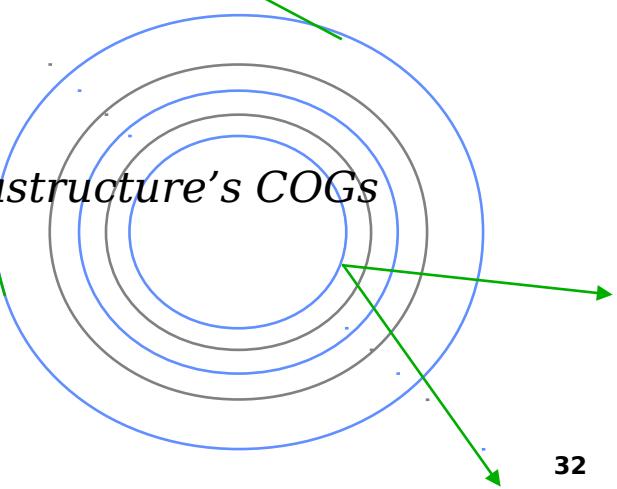
*Infrastructure's COGs*

Leadership  
System Essentials  
Infrastructure  
Population  
Forces



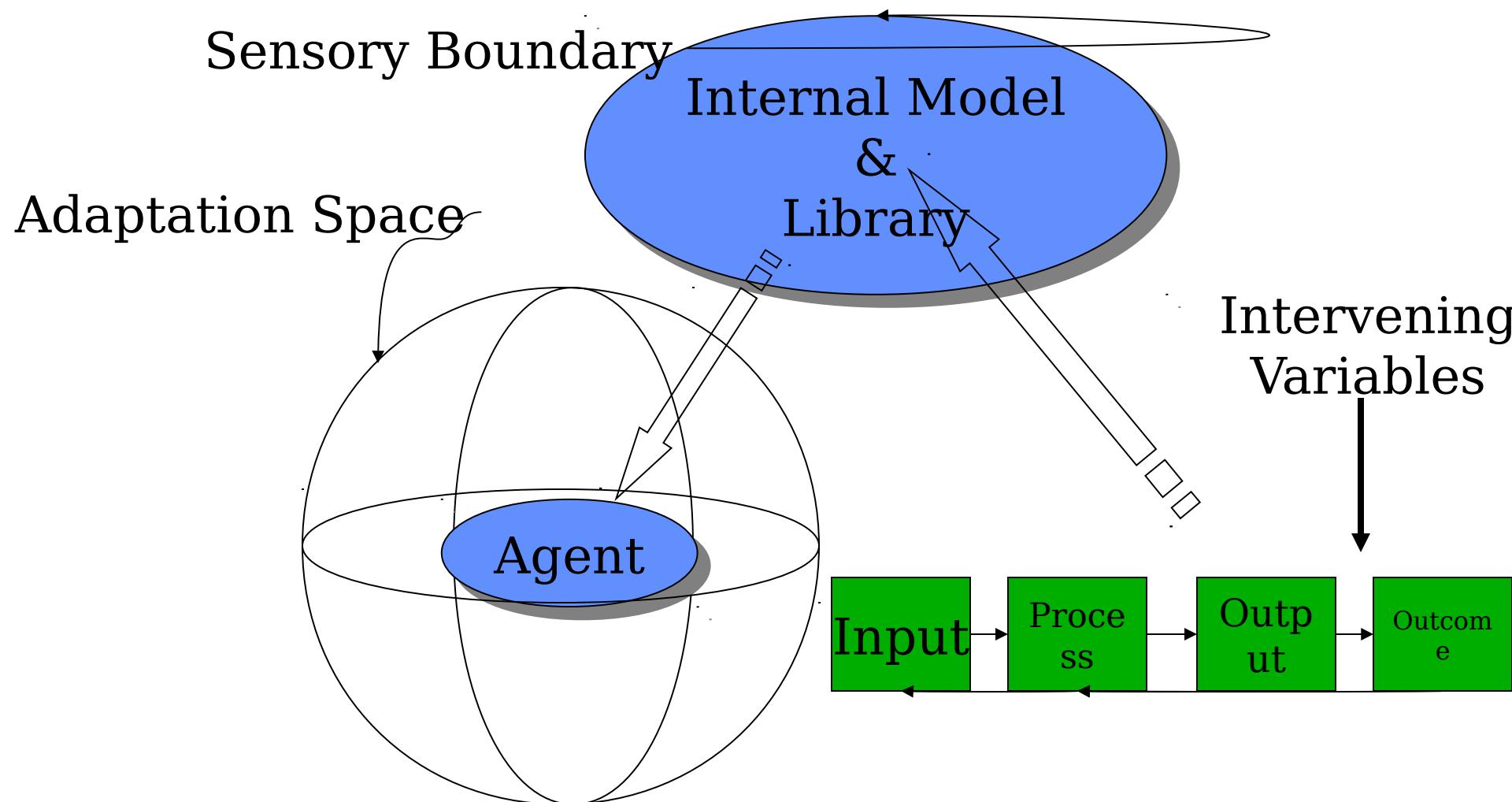
*The System Essentials of Infrastructure's COGs*

Leadership  
System Essentials  
Infrastructure  
Population  
Forces



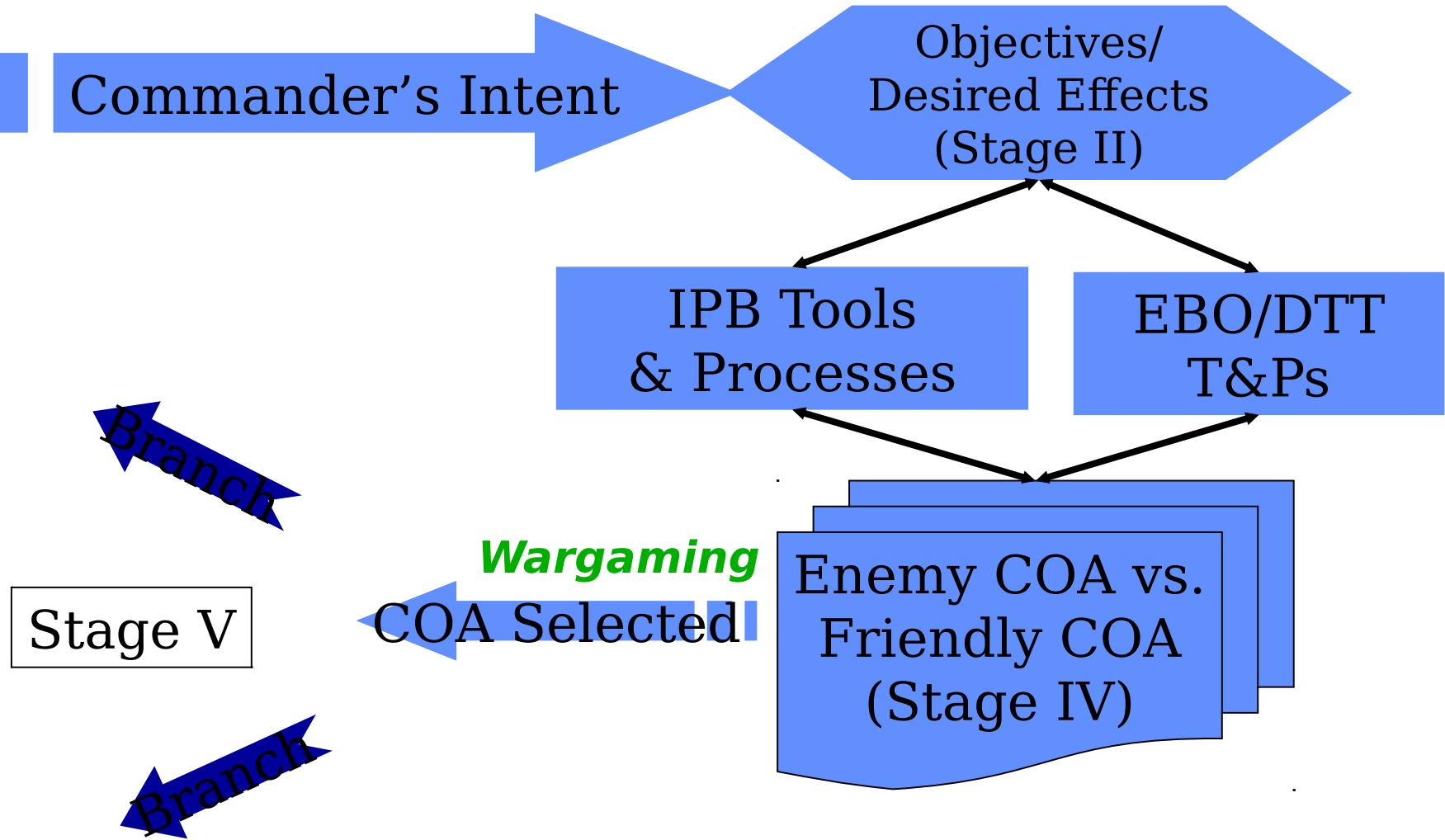


# McCrabb's Agent Adaptation Space (Stage I-V)





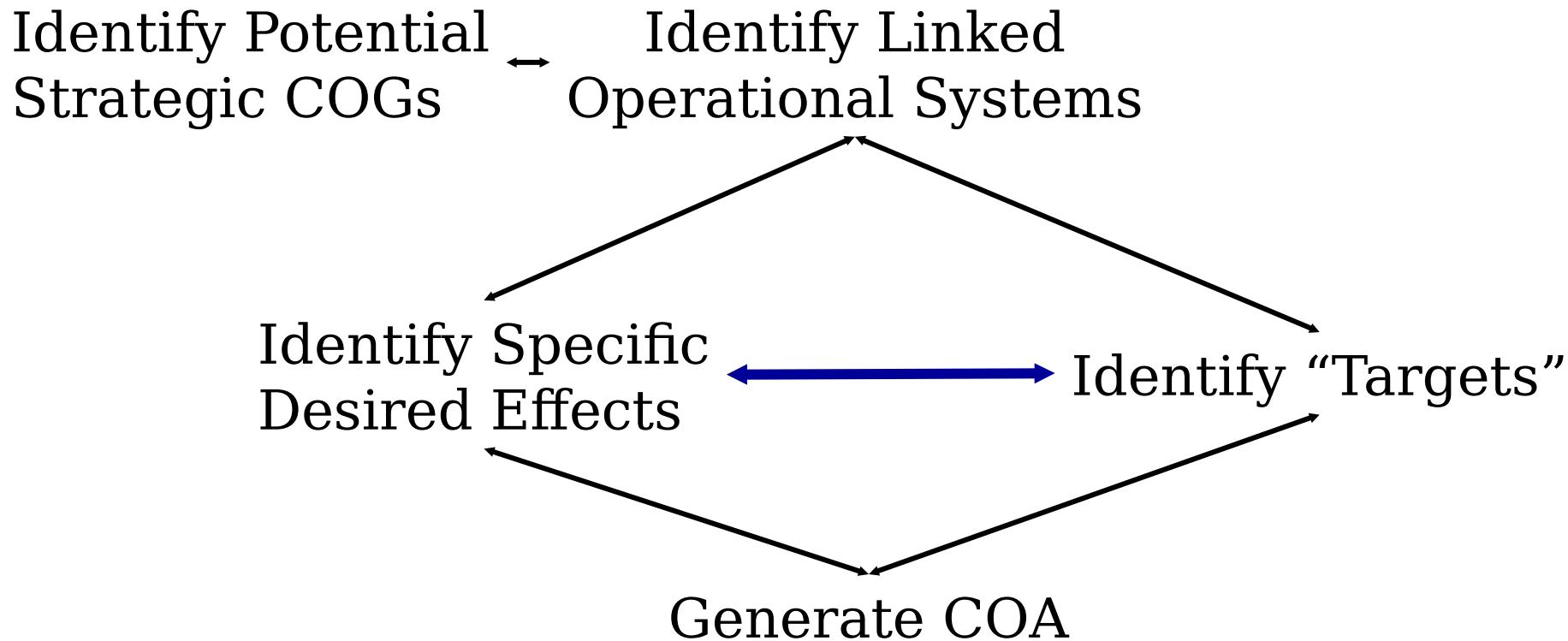
# The (Almost) Complete Puzzle (Stage I-V)





# Effects-Based Planning

**Everything Starts from Commander's Intent....**

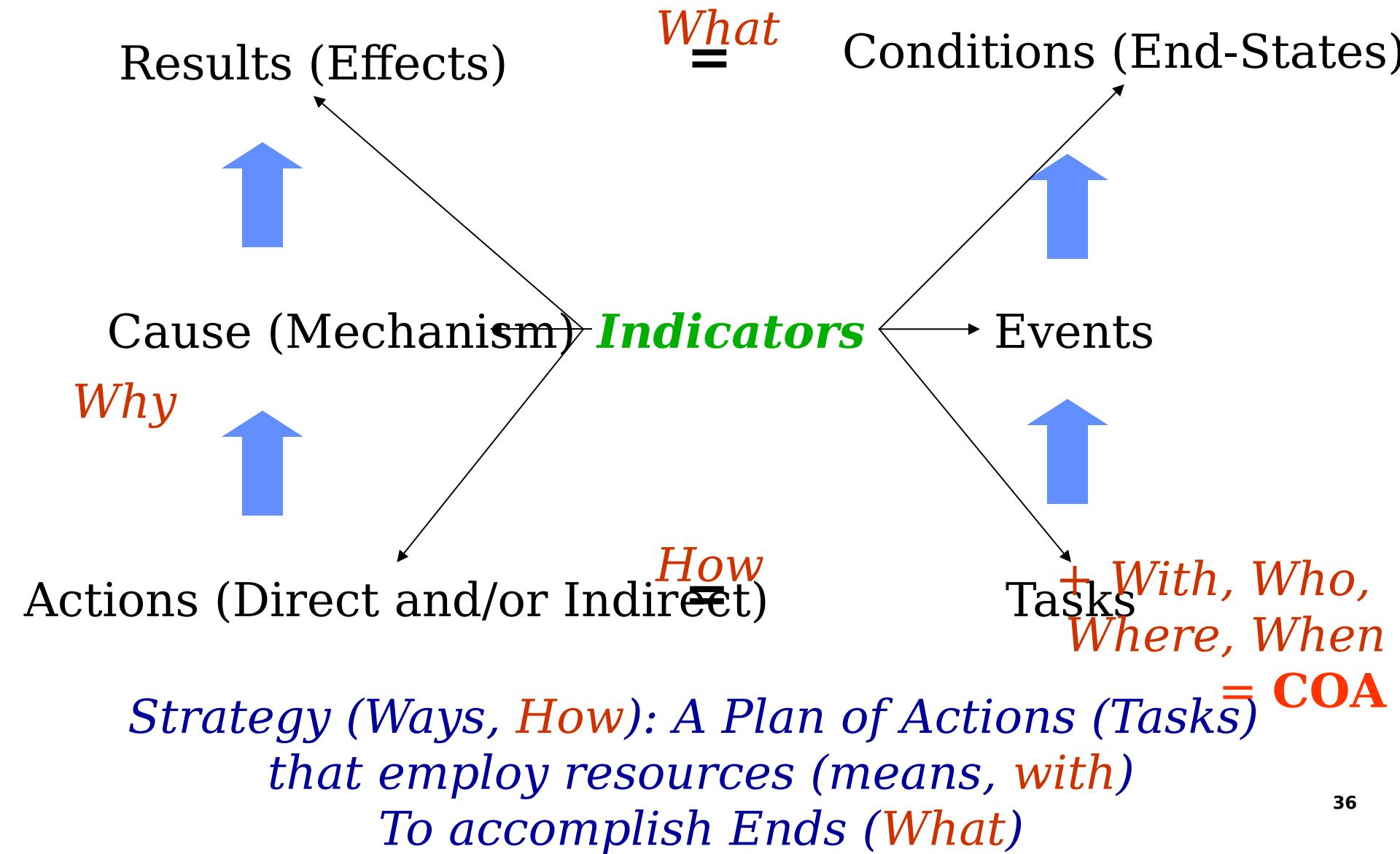


***Supports JP 3-56.1 Stages II-V***

*Modified from Dave Deptula's "Firing for Effect"*

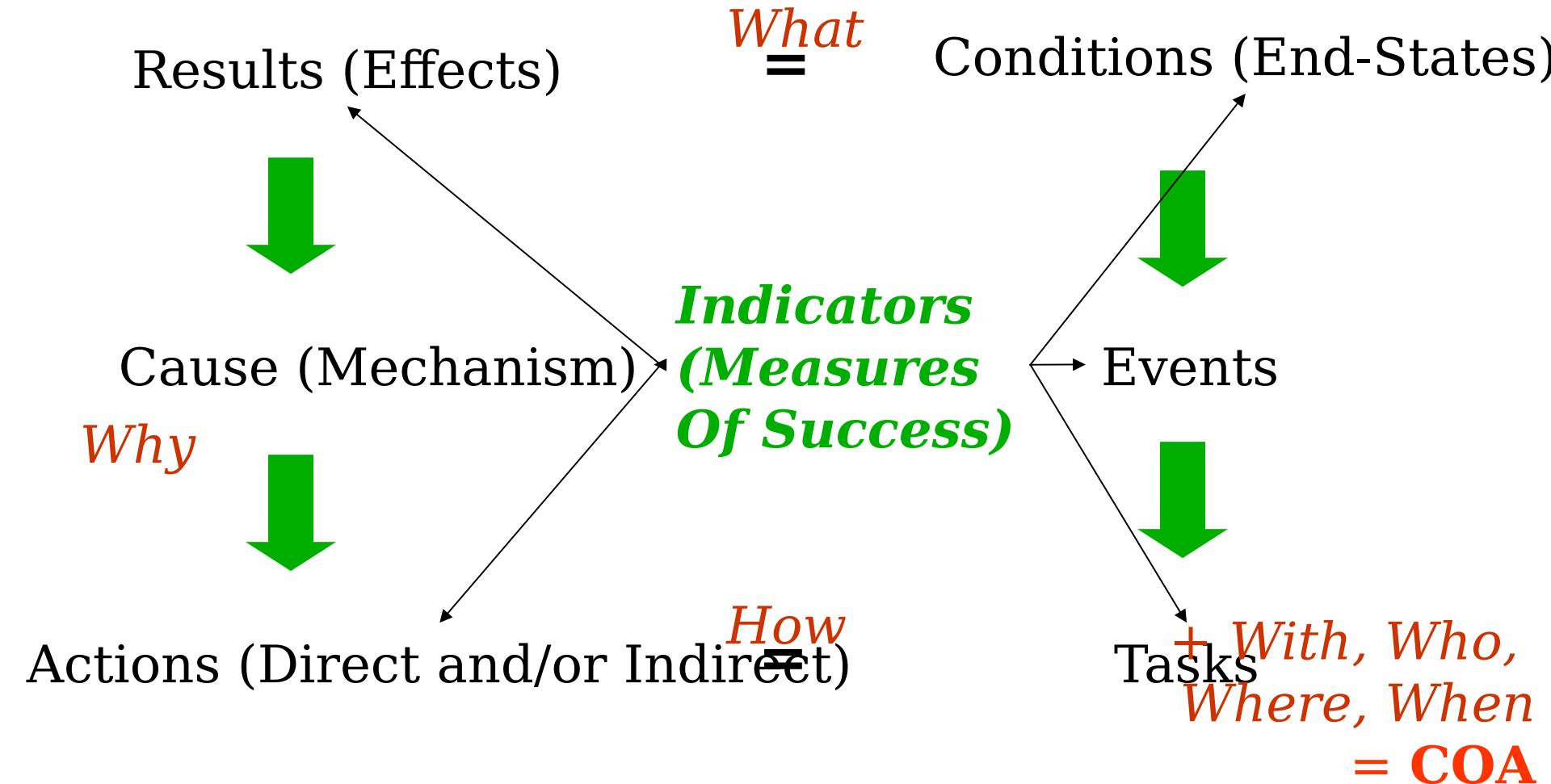


# Effects & Operational Art



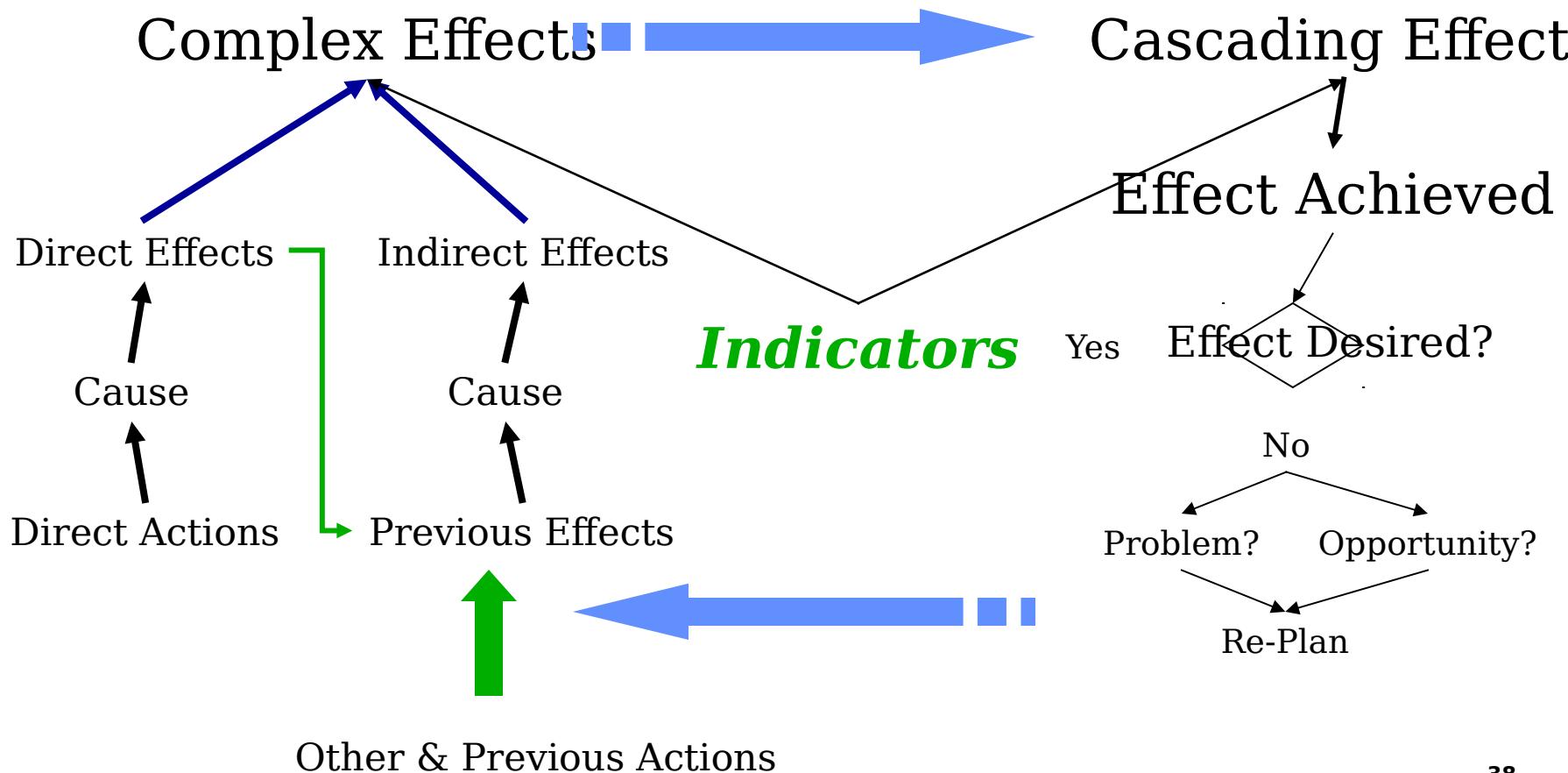


# Planning (Stage V)



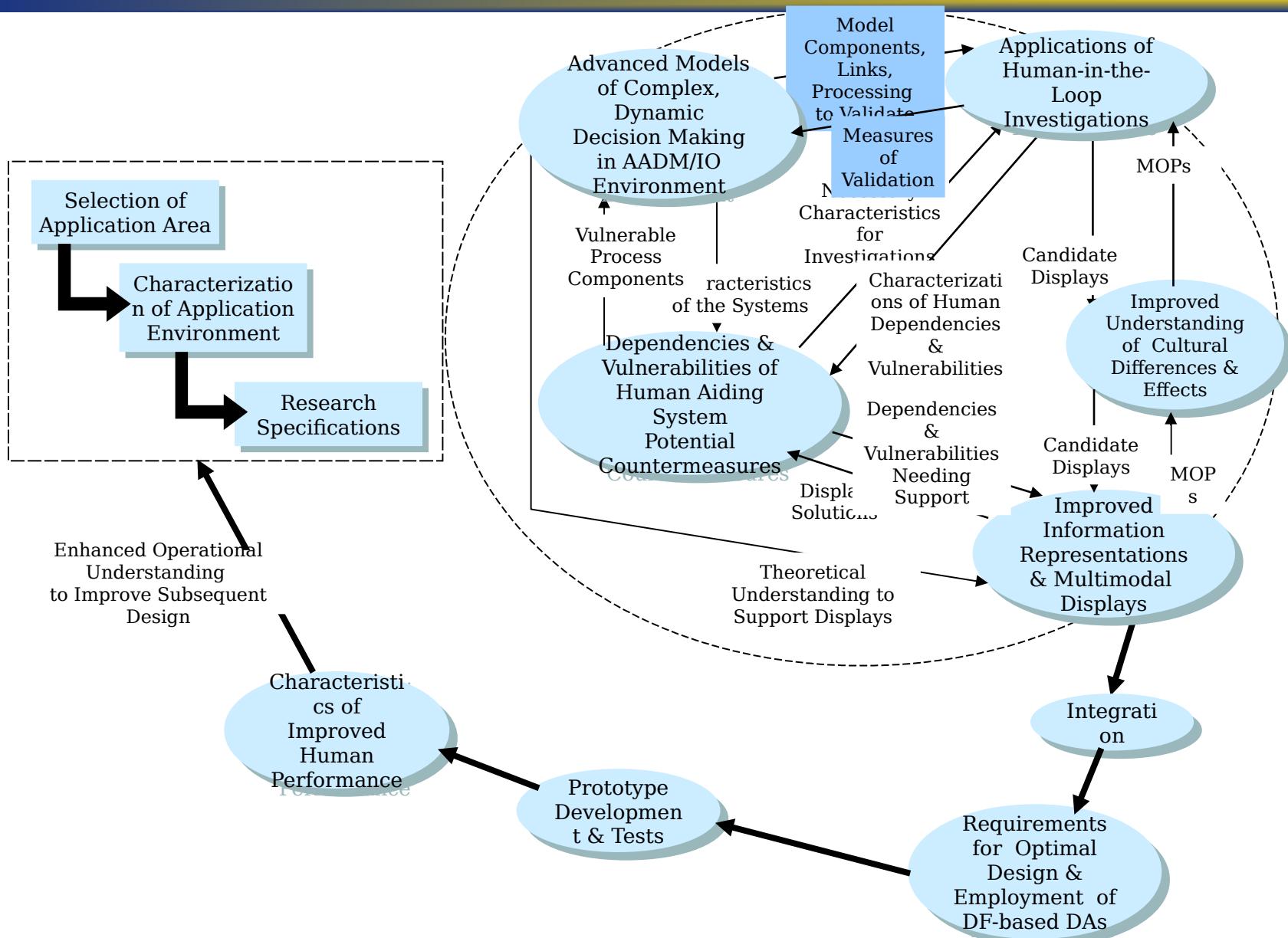


# Execution & Assessment





# Adversarial Models

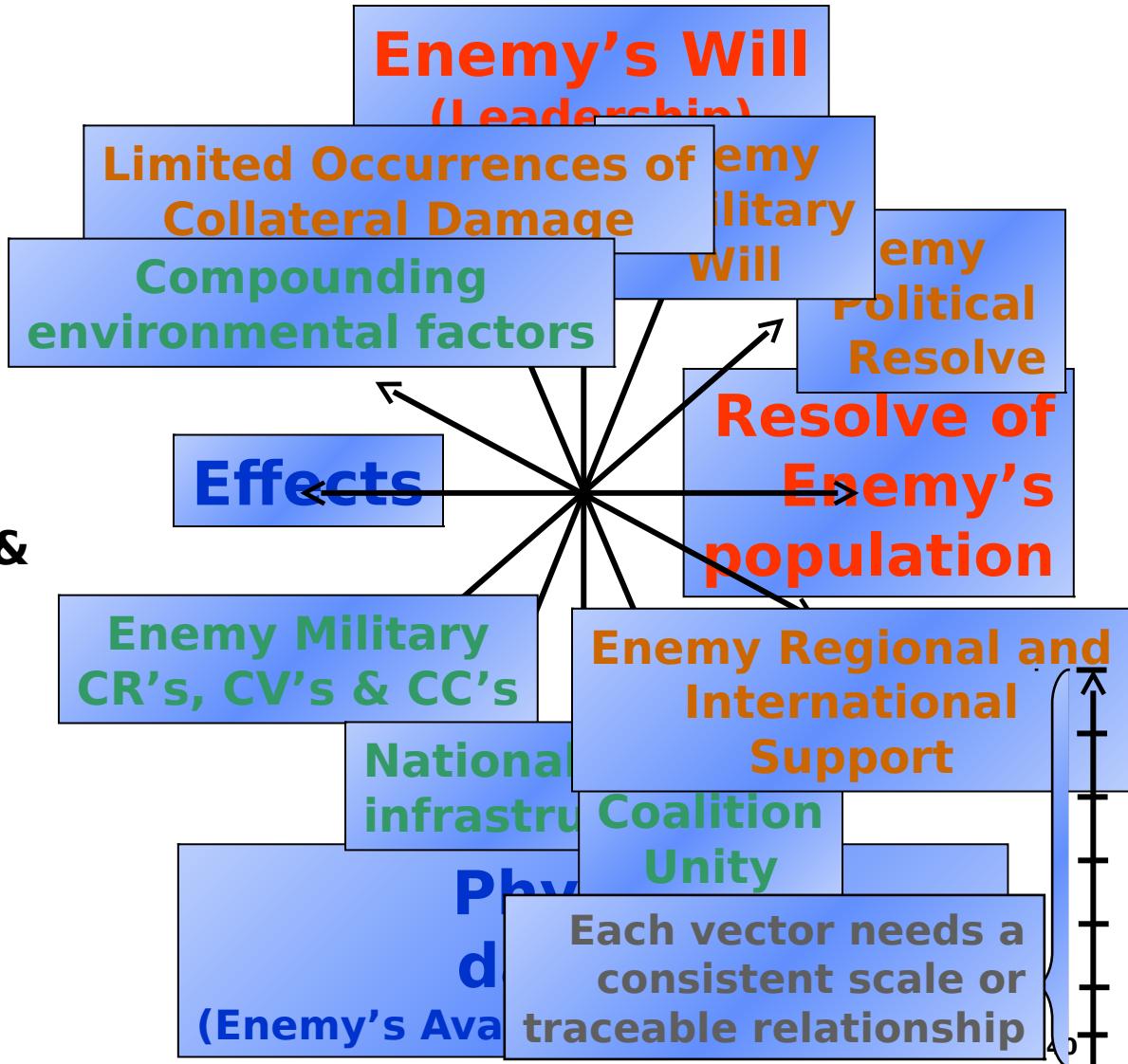




# Big Picture

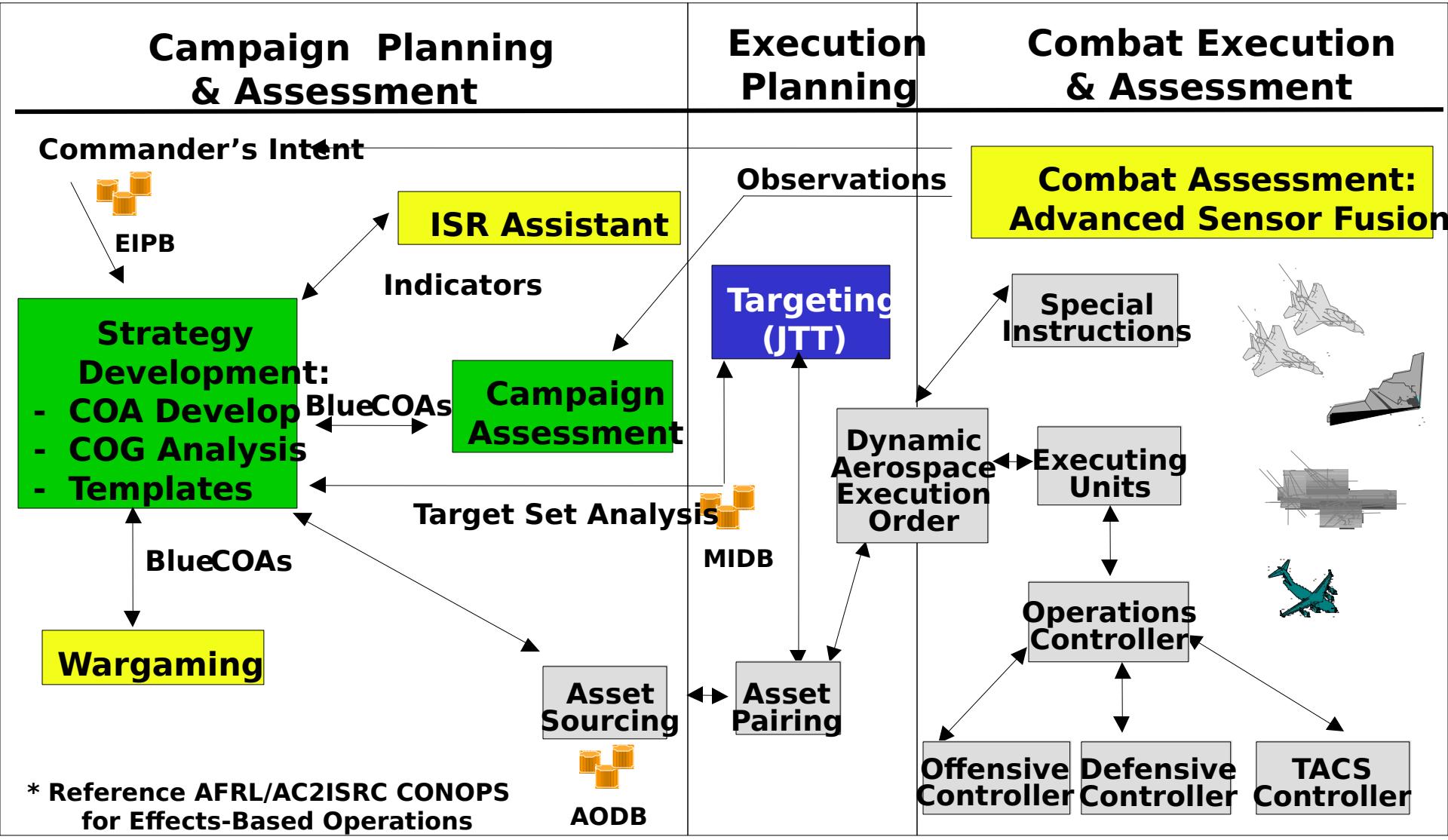


- EBO ATD seeks an integrated set of strategy, wargaming, COG analysis, and campaign assessment tools.
- Doctrinally sound; not dogmatically rigid
- Support EBO planning & assessment plus objectives-based or targets-based assessment
- Major Theater War => Humanitarian Relief; lethal & nonlethal; kinetic & non-kinetic (e.g., Info Ops)





# EBO Toolkit of the Future for Dynamic Tasking



\* Reference AFRL/AC2ISRC CONOPS for Effects-Based Operations



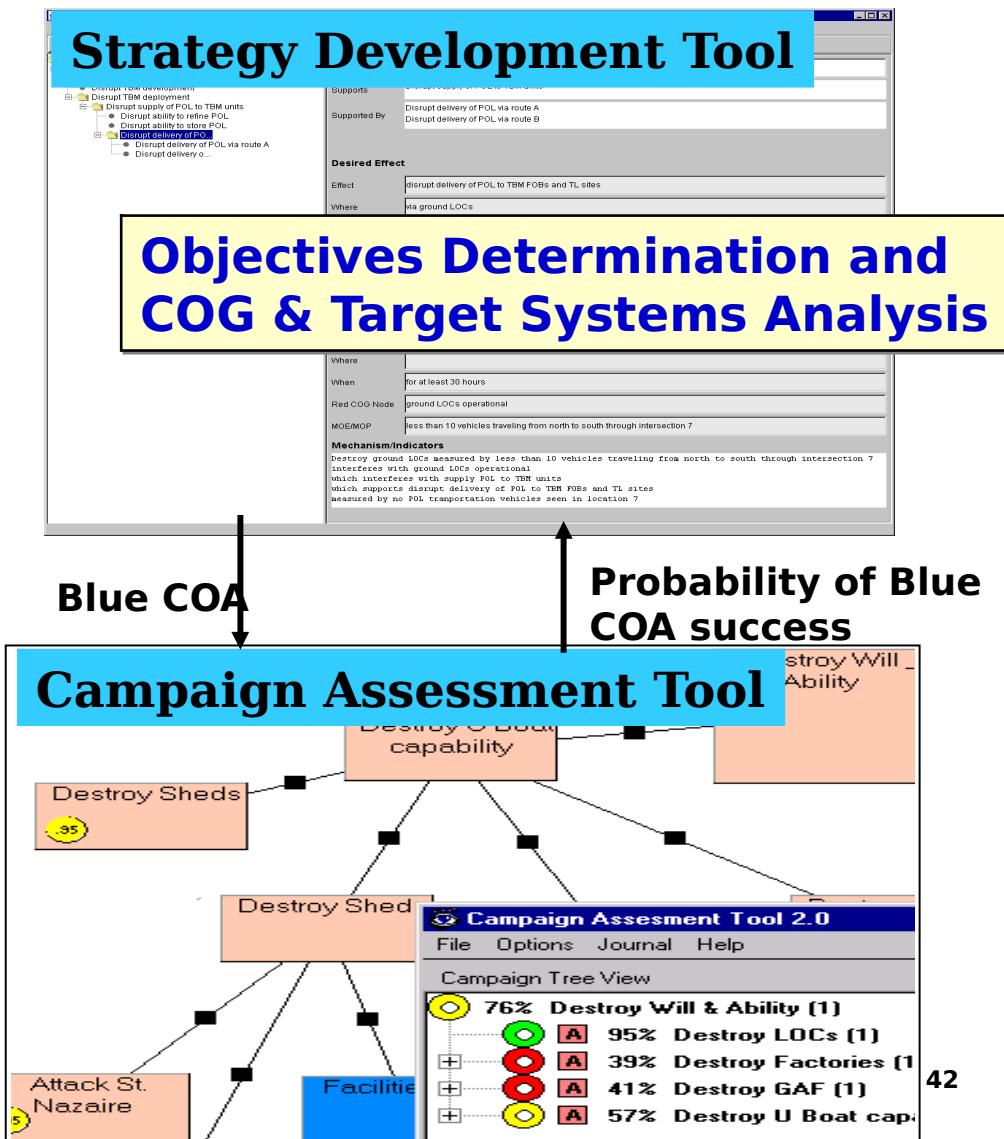
# EBO Key Products

- Strategy Development Tool

- produces blue COAs
- tightly integrates effects, center of gravity/target system analysis & strategy identification
- cross center of gravity interactions
- strategy & mission templates

- Campaign Assessment Tool

- predicts the probability of achieving Commander's intent for a blue COA
- model plan's cause/effects relations for a given campaign over time
- tradeoff analysis/drill down capability





# Strategy Development Tool Overview

File Edit Tools Templates Missions Show Help

EB Causal Analysis COG Analysis Map View Plan: Mission Templates:

**Effect**

Name: Disrupt WMD R&D Facilities  
Supports: Disrupt WMD development  
Supported By: Disrupt EP for WMD R&D Facilities  
Tasks: Effect: disrupt ability to assemble WMDs  
Where: within Orangeland  
When: for at least 90 day starting at c + 10 day  
COG Node: R&D Facilities Operational  
Indicator: Indicator  
MOE: MOE

**Legend**

**Objective**

**Effect**

**Indicator**

**Task**

**Mechanism**

**Task/Activity**

Win the War

Acceleration of Straggler Count

Destroy Will

Enemy

River Clear

Prevent River Crossing

Carpet Bomb

Drop Leaflets

Halt

Second Echelon

Traffic Density

Units in Bivouac

Bridge 1

Bridge 2

Destroy

Fuel Reserve

DMPI 1

DMPI 2

(Deny Access)

(Isolate the Battlefield)

DMPI 1

DMPI 2

... C-7 : -1 C+0 : 6 C+1 : 7 C+2 : 8 C+3 : 9 C+4 : 10 C+5 : 11 C+6 : 12 C+7 : 13 C+8 : 14 C+9 : 15 C+10 : 16

Name Start End Dur

Disrupt WMD Development C-1 C+... 11

Disrupt WMD R&D Facilities C-1 C+... 11

Disrupt Assembly at R&D Facility C+2 C+6 4

Destroy Substation A C+2 C+4 2

Disrupt EP 4 C+2 C+5 3

Destroy Generator Charlie C+5 C+6 1

Disrupt Assembly at R&D Facility C+5 C+... 5

Destroy Substation B C+5 C+7 2

Disrupt EP 4 C+5 C+... 5

Disrupt Chemical Production (ex C-1 C+4 5

Disrupt POL C-1 C+4 5

Deny access C+0 C+2 2

Destroy Substation

Disrupt EP 4

Generator

Destroy Substation

Disrupt EP 4

Disrupt POL

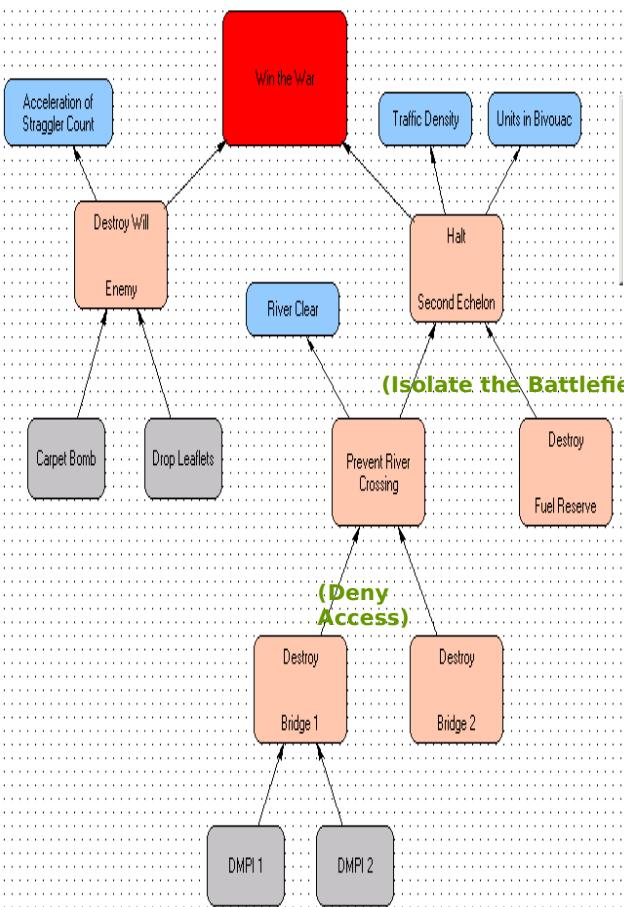
Deny access

Plan: sdt\_extended.new.2.xml

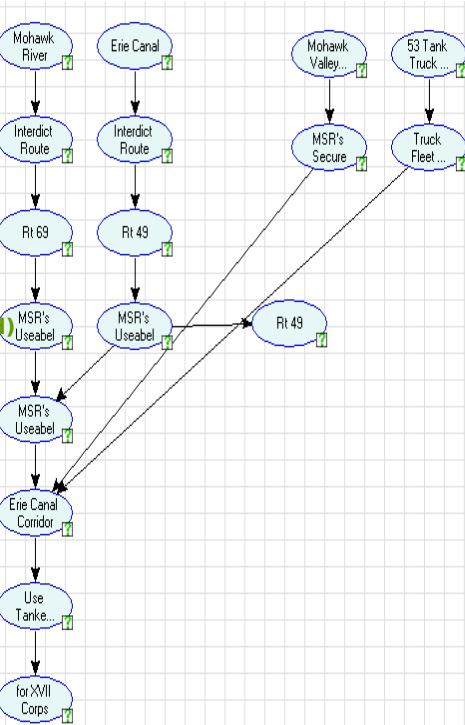


# Campaign Assessment Tool Overview

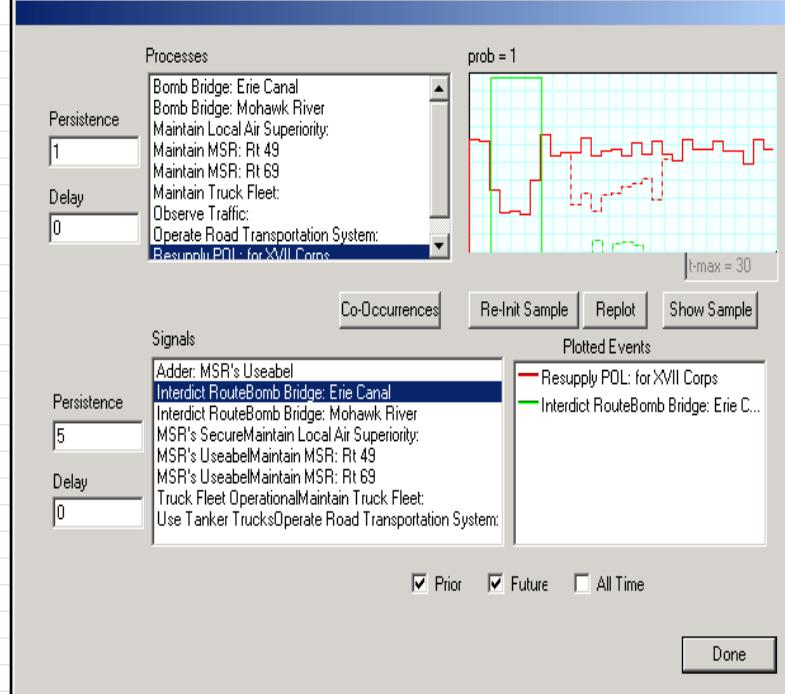
## Build A Causal Model



## Compile to a Bayes Net



## Analyze Results

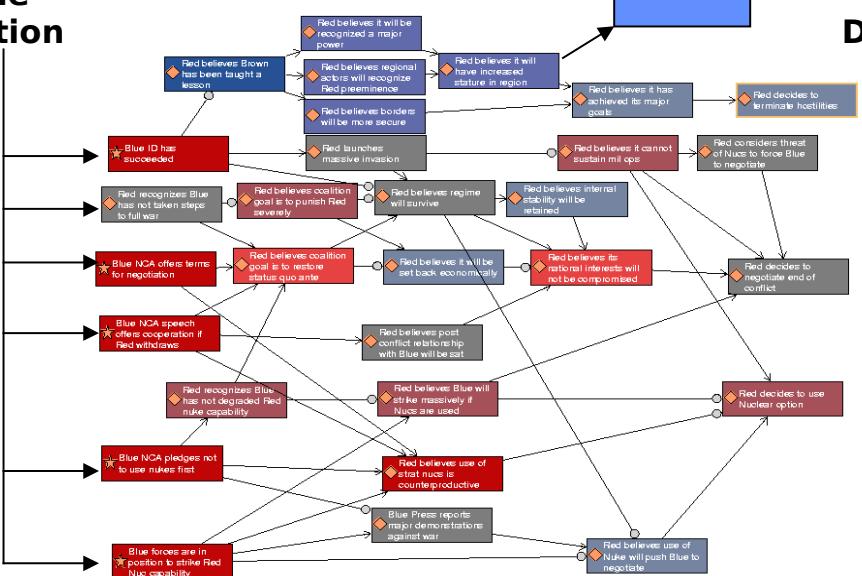




# EBO Approach to Homeland Defense



## Blue Action S



## Lead To Indicator

## Red Decisions

### Financial



### Diplomacy



### Taliban



AFPHOTO

### Military Action



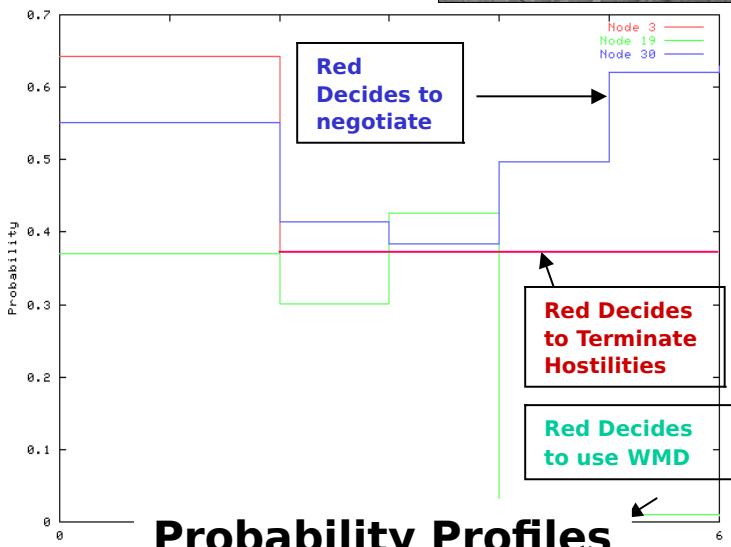
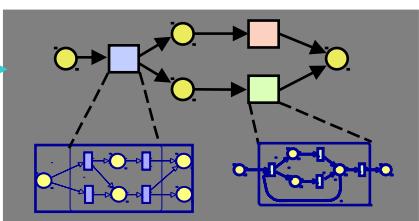
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## Influence Net

## Indicator

## EXECUTABLE MODEL

**COAs**  
(actions/ times)





# SDT: ATD vs. Objective System



## Anticipated Capabilities

- **Limited coverage of strategies, JFC/JFACC missions; Limited IW**
- **Limited COG/TS analysis; no Mission Analysis/Situation Development**
- **No COA analysis/comparison capability**
- **No JAOP development support past COA option development**
- **No CS (e.g., Logistics, Mobility), TACS, or Space considerations/Risk Analysis**

## Required Capabilities

- **Covers all strategy options**
- **Covers all JFC missions (e.g., HUMRO, PK/PE, etc.)**
- **Covers all JFACC missions (e.g., CA, SA, CL, etc.)**
- **Incorporates lethal/nonlethal, kinetic/non-kinetic applications of force**
- **Supports Joint Air Estimate Process through JAOP development (JP 3-30)**
- **Supports JFACC Daily Guidance planning (JP 3-30)**



# CAT: ATD vs. Objective System



## Anticipated Capabilities

- **Outcome assessment at Force and Campaign levels**
- **Limited ability to incorporate evidence**
- **Complete drilldown, predictive and reconstructive assessment**
- **Value-of-information ISO collection management and branch planning**

## Required Capabilities

- **Predictive assessment ISO COA development**
- **Assessment of outcomes ISO Engagement, Battle, Force and Campaign execution**
- **Reconstructive assessment of outcomes ISO plan refinement**
- **Incorporation of all-source information**
- **Drilldown to action, causes, and mechanism level**



# Summary



- **Definitional issue only a start**
  - No approved dictionary let alone glossary or encyclopedia
- **Ontology common to all applications**
  - A common task but a common ontology server
  - Basis for library
- **Not just EBO: IPB (Fusion), JBI, IW, TUT, TST, etc.**
- **Shared language essential to shared understanding**
  - Shared understanding alone insufficient



# *Operation* **ALLIED FORCE**



# Operation Allied Force EBO Example (1)

(from DOD AAR)



Milosevic accedes to NATO's conditions  
(total **Desired Effect**)

**Air Attacks**  
(Military Effect)

Russian Diplomacy  
(Diplomatic Effect)

Kosovar Albanian Attacks  
(Military Effect)

Solidarity of NATO  
(Diplomatic Effect)

Buildup of NATO Ground Power  
(Military-Diplomatic Effect)

Sanctions, etc.  
(Economic Effect)

Expanded on Next Slide

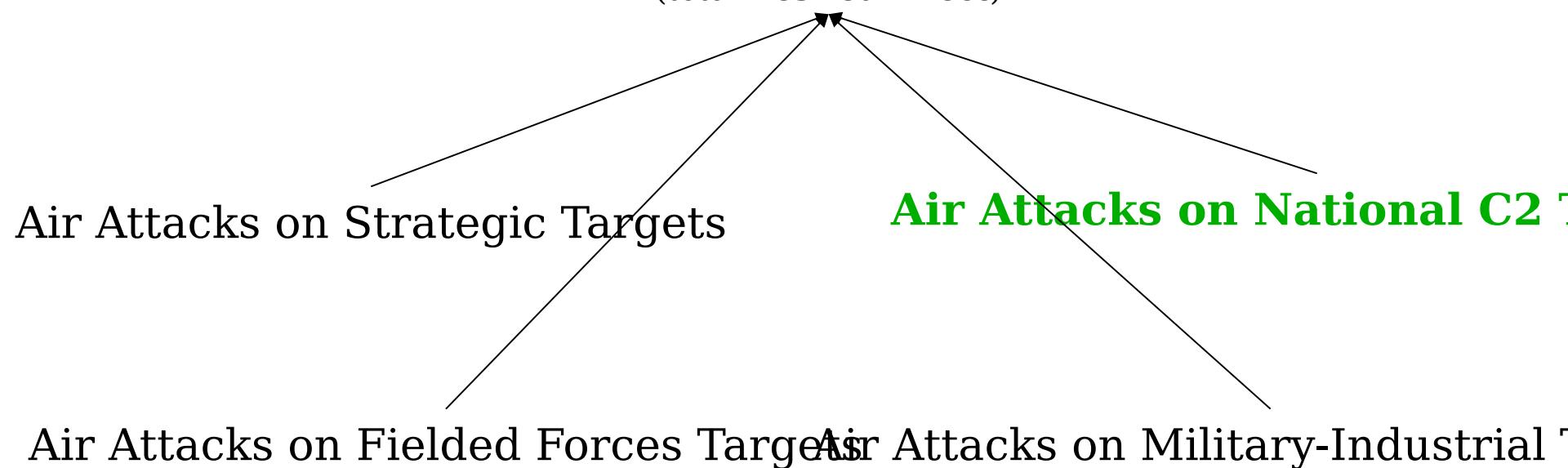


# Operation Allied Force EBO Example (2)

(from DOD AAR)



Milosevic accedes to NATO's conditions  
(total **Desired Effect**)



Expanded on Next Slide



# Operation Allied Force EBO Example (3)

(from DOD AAR)

